**Effect of Water on $CO_2$ uptake by Ionic Liquids with Aprotic Heterocyclic Anions**

Mauricio Quiroz Guzman, Cheng Chung, Ross Verploegh, Chaojun Shi, Sam Seo and Joan Brennecke [C, S]
*University of Notre Dame, Dept. of Chemical and Biomolecular Engineering, Notre Dame, IN, U.S.A.*
*jfb@nd.edu*

Ionic liquids are attractive candidates for $CO_2$ capture technologies. In particular, we have developed a series of ionic liquids based on aprotic heterocyclic anions (AHA ILs). The reaction enthalpy can be tuned by choice of electron-withdrawing substituents and the absence of free protons means that the viscosity does not increase when the ionic liquid reacts with $CO_2$. However, in removing $CO_2$ from post-combustion flue gas, an important impurity is water. In this presentation we explore the effect of water on ionic liquids for $CO_2$ capture applications. In particular, we determine which anions experience reprotonation (and, therefore, deactivation) in the presence of water and acid. Carbonic acid, of course, is formed when $CO_2$ and water are present. In cases where reprotonation does not occur, we examine the effect of water on the $CO_2$ capacity. This is complemented by measurements of water solubility, of the pure IL and of the IL complexed with $CO_2$. Moreover, we examine the effect of water on the viscosity of the AHA IL and the AHA IL when it is complexed with $CO_2$. Interestingly, we observe an increase in the viscosity when water is present that we did not observe without water. At higher water concentrations the viscosity then decreases. Finally, we explore strategies for dealing with water in $CO_2$ capture processes using ionic liquids.